

Residential Circuits and Wiring Information Sheet

The *State Building Codes and National Electrical Code (NEC)* provide minimum standards for creating an environment of health and safety for all city residents.

This handout contains limited information on circuit installation and wiring. Additional information is needed to properly install wiring. Circuit installation and wiring requires a fair amount of skill and experience. Certain installations are best left to the professional.

Inspections

Rough-in: This inspection must be done before any wiring is covered with insulation, sheet rock, paneling, etc. Underground wiring must be inspected before the trench is covered. **Do not install switches or receptacles before this inspection.**

Final: Schedule an inspection when all devices and fixtures have been installed and the wiring is entirely completed. Non-metallic (NM) and Service Entrance (SE) cables not to exceed 60 degree conductor rating. Update the electrical panel directory. It is the permit holder's responsibility to call for a final inspection. **Remember, have your electrical permit number ready when you call.**

Circuits required for additions and remodeled areas

- Bathroom receptacles: one separate 20 amp circuit.
- Kitchen receptacles: two separate 20 amp circuits.
- Laundry receptacle: one separate 20 amp circuit.
- General lighting: one 15 amp circuit for every 600 square feet.

Most appliances, such as dishwasher, disposal, furnace, air conditioner, electric range, electric dryer, and microwave, require separate circuits.

Switch controlled lighting

- Most areas, including halls, need switch controlled lighting. Switched or half-switched receptacles are acceptable.
- Switch required at top and bottom of stairs.

Receptacle outlet spacing

- Kitchen: 24 inches from the beginning of a counter space and then every 48 inches.
- Habitable rooms: six feet from the beginning of a wall space then every 12 feet.
- Room dividers, patio doors, etc., are considered wall space.
- All receptacles must be Tamper Resistant (TR).

Ground Fault Circuit Interrupters (GFCIs)

GFCI protection is required for all receptacles in:

- Bathrooms.
- Garages.
- Unfinished basements.
- All kitchen counter receptacles.
- Outdoors-must be Weather Resistant (WR).
- All receptacles must be Tamper Resistant (TR).

Wire length, splicing and groundings

- All boxes must have a minimum wire length of six inches.
- The outer cable jacket must extend at least 1/4 inch into the box.
- If a receptacle box has more than one ground wire, the ground wires must be spliced with a "wire tail" attached to the receptacle's grounding screw; only one conductor is permitted under a terminal screw.
- All metal boxes must be grounded. Use ground screw or ground clip.
- All splices require wire nuts.

Junction boxes

- Do not conceal junction boxes. Junction boxes are required to be accessible.
- Make sure device box is correctly sized for the device used. (i.e. ground fault receptacles, dimmers, etc.)

Box volume

| | Box volume <i>In cubic inches</i> | |
|------------------------------|--------------------------------------|----------|
| | #14 Wire | #12 Wire |
| Each conductor | 2 | 2-1/4 |
| Ground wires in box | 2 | 2-1/4 |
| Each switch in box | 4 | 4-1/2 |
| Internal cable clamps in box | 2 | 2-1/4 |

For example, a 2-gang switchbox with four "14-2 with ground" cable in the box requires:

Eight conductors 16 cu. in.
 Ground wires 2 cu. in.
 Two switches 8 cu. in.
 Internal cable clamps 2 cu. in.
Minimum box size 28 cu. in.

Strapping cables

- Plastic cables must be strapped within eight inches of boxes and at intervals of no more than 4-1/2 feet.
- Plastic cables must not be installed closer than 1-1/4 inches from face studs and joists.
- Cables closer than 1-1/4 inches must be protected with metal plates.
- Cables to be away from sharp edges (i.e. flues, ducts, pipes, etc.)
- Up to three cables stacked under a single staple. Over three cables require a stack staple.

Underground wiring

- Direct burial cables (Underground Feeder/type UF) must be in a trench 24 inches deep.
- Electrical PVC conduit must be in a trench 18 inches deep.

Listed equipment

- Use listed equipment only (i.e. UL, ETL, AGA).
- Follow instructions provided with equipment.
- Only use the listed brand of circuit breakers for the load center. Don't mix brands.

Miscellaneous

- Clothes closets, electric dryers and ranges, hydro-tubs and subpanel installations have many special code provisions (refer to applicable code articles).
- Smoke detector location is mandated by the *International Residential Code*.

Questions?

The Building and Inspection Division is open 8 a.m. to 4:30 p.m., Monday through Friday. Call 952-563-8930 to schedule an inspection.

This information is a guide to the most common questions. It is not intended, nor shall it be considered, a complete set of requirements.